e19 Post-Darwinian thinking

< unification of comparative anatomy, embryology, and paleontology >

> Why deprive yourself of that classic delivery-room denouement, the culmination of nine months of waiting, when you hear the obstetrician announce: 'It's a monkey! A very attractive monkey!' —Randy Cohen.[1]
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> We do not, after all, expect to encounter a page-one story with the headline 'New Experiment Proves Earth Goes Around Sun, Not Vice Versa. Galileo Vindicated.' The fact of evolution has been equally well documented for more than a century. —S. J. Gould.[2]
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> However, headlines were so when Galileo's 1632 trial verdict was reversed by the Vatican in 1992.[3]

Petrus Camper (1722-1789) in his 1778 lecture "On the Points of Similarity between the Human Species, Quadrupeds, Birds, and Fish; with Rules for Drawing, founded on this Similarity," demonstrated the principle of correlation (parts in all the animals belonging to the same class are homologous) by the mechanical exercise he called a *metamorphosis*. At the time, he had found "amusing" that the angle from jaw to forehead of a human, ranked facial beauty: least being 58° of an orangutan (on which he had written a monograph), to that of 80° of a typical European profile being surpassed "by the rules of art alone" by the near-vertical of the Apollo Belvedere (a lauded ancient sculpture).[8] After *Origin*, such non-racist rankings, Martin Kemp has pointed out, were "exploited, to detect those races that stood closest to the animal origins of man."[9] Also, was a misguided enthusiasm for social Darwinism that should in fairness be called social Spencerism for its advocate, as Dawin wanted no part of it.[10]

Comparative anatomy and embryology (development and differentiation) explain homologies. But neither gives the same account. For example, do arthropods come from a common origin? Comparative anatomy indicates monophyly for the arthropods while embryology indicates adult forms must be convergent because different "arthropod" groups do not pass through all the same ontogenetic (growth) stages. No resolution was possible for these conflicting observations before *The Origin of Species*, 1859. Thereafter, both embryology and morphogenetic change could be understood as subject to selection. Historical biology in its account of the tree of life acquired clarity in post-Darwinian days, by unifying comparative anatomy, embryology (although the "how of it" was unexplainable before molecular-biology began, mid-1900s), and (evolutionary) paleontology.[4]

In March 1860, botanist Asa Gray (1810-1888) published a favorable review of *Origin* in the *American Journal of Science*. Darwin thought it the best commentary to have appeared up to that time. Later in the year, Gray published a three-part review of *Origin* in the *Atlantic Monthly*. This was happily reprinted by Darwin and circulated in Britain.[5] Darwinian theory was also popularized by Grant Allen's (1848-1899) articles in *Fortnightly Review* and *Cornhill Magazine*, and by Edward Clodd's (1840-1930) *The story of creation; a plain account of evolution*, 1888.[6] George John Romanes (1848-1894) in 1886 suggested that to *natural selection* be added *physiological selection*.[7]

Natural selection acts on the germ line was August Weismann's contribution in 1893.[11] However, epigenetic inheritance (the transmission of information from a cell or multicellular organism to its descendants without that information being encoded in the nucleotide sequence of the genes) has been observed.[12] But the transferred characteristics are not preserved in the long run. Nevertheless, **James Mark Baldwin** (1861-1934) in *A New Factor in Evolution*, 1896, proposed a process that he called "organic selection" which could cause "accommodations" to become hereditary.[13]

Darwin emphasized that great lengths of time are needed to effect lasting change in a species. The mechanistic (heartless) process of natural evolution itself assaults human sensibilities. Darwin bit that bullet and is remembered. Wallace (disparagingly known as "Darwin's moon")[14] was more wimpish and, mostly forgotten, retained in his natural selection process a teleological component for humanly desirable efficiency (as one would have in a slaughter house to minimize suffering).[15]

Darwinian materialism that arrives at humans along with poultry as being at best temporarily animated meat remained incomplete and rather muddled, giving the needful of being "the chosen," as Sedgwick, Owen, Saint George Jackson Mivart (1827-1900),[16] and still, heart until, rationally, a particulate Mendelian notion of heredity was rediscovered at the beginning of the 1900s. Judith Hooper, in *Of Moths and Men*, writes: "Despite this revolutionary new information, it would take twenty years for the Darwinians to appreciate what Mendelism had [had in the 1850s] to offer. ... Darwinian biometricians, who worked on the puzzle of heredity, had equations for calculating the resemblances of various traits between parents and offspring, but, like Darwin, they could not explain how variations could persist in a population without being 'swamped'. It was the old problem of the grey rabbits, which a particulate notion of heredity could have dispelled in an instant."[17] And did when the Synthetic Theory of Evolution was put together (see *Topic f14*). Until then, what was meant by "evolution" was not certain (and therefore "species" could not be clearly defined).

By attention only to the name given a theory, literati feel free to twist meaning as in snobbish Henry Adams famous crack: "The progress of evolution from President Washington to President Grant was alone evidence enough to upset Darwin."[18] (But read *Grant*, 2001, by Jean Edward Smith. Tellingly he quotes one Union officer as saying that no one had to read Grant's orders, "a second time to understand them.")[19]

Michael T. Ghiselin in 1966 could correctly find that a biological species' name refers to an "individual" not a class. This is because of evolution. A described biological species's name is in fact a proper name. As such, it cannot have defining properties that allow it to be a class name, which would include individuals indistinguishable from each other as defined.[20] Mark Ridley explains:[21]

> Many scientific classifications do define classes: chemical elements are classes, for example gold consists of all elements with atomic weight 79. But are biological species like the class of chairs, or the particular chair [built in a certain place, put in the library, has its arm broken by a student, is stained when a mug of coffee (existentially contrary to library rules) is spilled on it, and is finally destroyed by the gravity of a fat professor]? Most biologists before Ghiselin accepted that each species is a class: thus we speak of a person as being a "member" of *Homo sapiens*, and species as having "definitions" drawn up by museum-bench taxonomists.
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> Ghiselin noticed that, because of evolution, biological species cannot have defining properties. All swans may be white now, but if one mutated to black it would not cease to be a member of the swan species (assuming it could interbreed as normal). A species originates in a speciation event, evolves indefinitely down a lineage, and becomes extinct, analogously to that individual chair. The attributes that a species happens to possess are a contingent matter, like the attributes—the clothes or hairstyle—of a person. Individual attributes may help you to recognize someone at a certain time, but they do not logically define the person, because they can be changed without changing the person into someone else. Linnean names, like *Homo sapiens*, are therefore proper names. A taxonomic description is logically a diagnosis not a definition.

In 1953, George Gaylord Simpson suggested that the "Baldwin effect" (the acquired adaptive responses of individual organisms) is theoretically possible and may have actually occurred but was so rare that evolutionary theory could ignore it.[22] Baldwin's own account of the coevolution of social-heredity and biology-culture resembles the modern ideas of epigenetic-inheritance and niche-construction.[23] Niche construction creates an indirect causal pathway by which modifying selection pressures act back on the organism. Kevin N. Laland summarizes: "the idea is that organisms shape the environments in which they live—and ecological (extragenetic) inheritance."[24] Theories of language and brain evolution, addressed by Terrence Deacon and Daniel Dennett in *Evolution and Learning*, 2003, appeal to the Baldwin effect as a needed and best available mechanism to add to natural selection.[25]

John Odling-Smee, Kevin Laland, and Marcus Feldman in *Niche construction*, 2003, write: "Organisms, through their metabolisms, activities and choices, define and partly create their own niches. They may also partly destroy them. This process of organism-driven environmental modification is called 'niche construction.' Niche construction regularly modifies both biotic and abiotic sources of natural selection and, in doing so, generates forms of feedback that change the dynamics of the evolutionary process."[26] ❑